A Reference Model for Requirements and Specifications

Gunter, Gunter, Jackson, and Zave
IEEE Software May/June 2000
Pp37-43

Why?

• What is the practical value of having an accepted reference model?

Environment vs System

The distinction between environment and system is a classic engineering issue that is sometimes regarded as a matter of taste and convenience but which has a profound effect on problem analysis. The reference model de-

W, R, S, P, and M

Environment vs system - 2

Designations identify classes of phenomena—typically states, events, and individuals—in the system and the environment and assign formal terms (names) to them. Some of these phenomena belong to the environment and are controlled by it; we will denote this set e. Others belong to the system and are controlled by it; we will denote this set s.

Phenomena

• e: phenomena belonging to environment and controlled by it
• s: phenomena belonging to the system and controlled by it
• e and s are disjoint
• Visible and hidden
Terminology

- \( W \) and \( R \) specified using terms in \( e_h, e_v, \) and \( s_v \)
- \( P \) and \( M \) specified using terms in \( s_h, s_v, \) and \( e_v \)
- \( S \) must be specified using terms in \( e_v \) and \( s_v \)

Patient Monitoring

reference model. We describe a simple version of the Patient Monitoring System in our terms. The requirement \( R \) is a warning system that notifies a nurse if the patient’s heartbeat stops. To do this, there is a programming platform \( M \) with a sensor to detect sound in the patient’s chest and an actuator that can be programmed \( P \) to sound a buzzer based on data received from its

Classifying terms

- Nurse
- Heartbeat
- Patient chest sounds
- Buzzer

Specification

- Which terms can be used in the specification?

Adequacy

\[ \forall e. \ W \land M \land P \Rightarrow R. \]

- That is, the requirements allow all the events the environment performs (\( e_h, e_v \)) and all the events the system performs (\( s_v, s_h \)) that can happen simultaneously

Adequacy and Patient Monitoring

- How does this apply to the example?
- What is \( R \)?
- What is needed in \( W, M \) and \( P \) to imply \( R \)?
L7S10 adequacy

- Construct the W, M, P, and R for the example that satisfies the adequacy
- 10 pts, due Tuesday, Oct 1st
- Individual assignment

Tuesday, Oct 1

- Existence Dependency: The Key to Semantic Integrity between Structural and Behavioral Aspects of Object Types, Snoeck and Dedene, IEEE TOSE, April 98
- IS session on Gunter’s Ref Model